

# Columbia Environmental Research Center Science Capabilities

The Columbia Environmental Research Center (CERC) provides technical leadership and scientific information on environmental contaminants, large river ecosystems, and impacts of habitat alteration. CERC has nationally and internationally recognized environmental science research and monitoring capabilities in:

- **Environmental Toxicology**
- **Environmental Chemistry**
- **Biochemistry and Physiology**
- **Ecological Research**
- **Large River Studies**
- **Information -- Technology Transfer**

## Environmental Toxicology

Research in environmental toxicology is designed to understand and evaluate the effects of contaminants on aquatic ecosystems, conducted in both laboratory and field. Capabilities include:

- Freshwater, marine, and estuarine sediment toxicology
- Standardization of acute and chronic toxicity test methods
- Site assessments including Ecological Risk Assessment, and Natural Resource Damage Assessment and Restoration (NRDAR)
- Bioavailability of metals associated with mining
- Sensitivity evaluations of endangered fish, amphibians, and mussels
- Acute and chronic toxicity testing of fish, amphibians, invertebrates, and mollusks
- Fish, amphibian, invertebrate, and mollusk culture

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## Environmental Chemistry

Environmental chemistry research is pivotal to the integrated approach of chemical discovery and biological cause and effect that is the basis of environmental contaminants research in the USGS. Environmental chemistry research encompasses a wide array of topics related to pollution, including fate of contaminants, analytical methods development, and assessment techniques for determining bioavailability and bioconcentration potential related to potential toxicological effects using both laboratory

and field investigations. Capabilities include:

- Development and application of analytical methods to determine ultra-trace residues, and assessment techniques to define contaminant bioavailability and residue dynamics
- Development and application of passive integrative sampling devices for organic and inorganic contaminants
- Development of analytical methods for emerging contaminants such as algal toxins, antibiotics, and new generation pesticides
- Separation and interpretation of complex contaminant mixtures
- Application of broad based instrumental techniques: GC/MS, GC, HPLC, ICP/MS

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## Biochemistry & Physiology

Biochemical and physiological research emphasizes sublethal effects of chemicals, which lead to behavioral, developmental, and population effects on fish and wildlife. Capabilities include:

- Understanding biochemical mechanisms of toxic action and linkages to cells or tissues
- Using egg microinjection techniques to evaluate effects on embryonic development
- Assessing endocrine function, sexual differentiation and development, chemical estrogenicity, biological indicators of effects
- Histological image analysis, qualitative and quantitative microscopy
- Developing methods for microbiological, biochemical, and immunochemical microassays

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## Ecological Research

Ecological research links physical, chemical, or biotic environmental stressors with ecosystem-level responses and includes laboratory and field assessments of habitat degradation on populations. Capabilities include:

- Biological effects of UV radiation to amphibians, fish, and aquatic invertebrates
- Ecological risk assessments, restoration, and monitoring
- Behavioral ecology and toxicology
- Aquatic on site toxicological assessment
- Multiple stressor interactions in natural

populations

- Ecological impacts of agricultural chemicals
- Plant/soil toxicology

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## Large River Studies

River studies examine the ecological consequences of land use, management actions, and altered flows on riverine environments by identifying and predicting the interactions between abiotic and biotic components. Capabilities include:

- Influence of invasive species on native populations
- Dynamic Geographic Information System (GIS) models, Global Positioning Systems (GPS), Decision Support Systems (DSS), remote sensing and long-term monitoring
- 3-D depth/velocity profiles, hydro-acoustic sediment mapping, side-scan sonar, geostatistical measures, fluvial geomorphology, hydraulics and hydrology, geospatial and digital image processing
- Radio and ultrasonic telemetry systems
- Benthic invertebrate community analysis related to aquatic ecosystem health

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## Information & Technology Transfer

Information and technology transfer capabilities include:

- Local and wide-area networks, Internet connectivity, web development and design
- Database design and management
- Library and technical services
- Clearinghouse for the National Biological Information Infrastructure (NBII), a USGS network of distributed databases and information sources for biological information
- Information analysis and management

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